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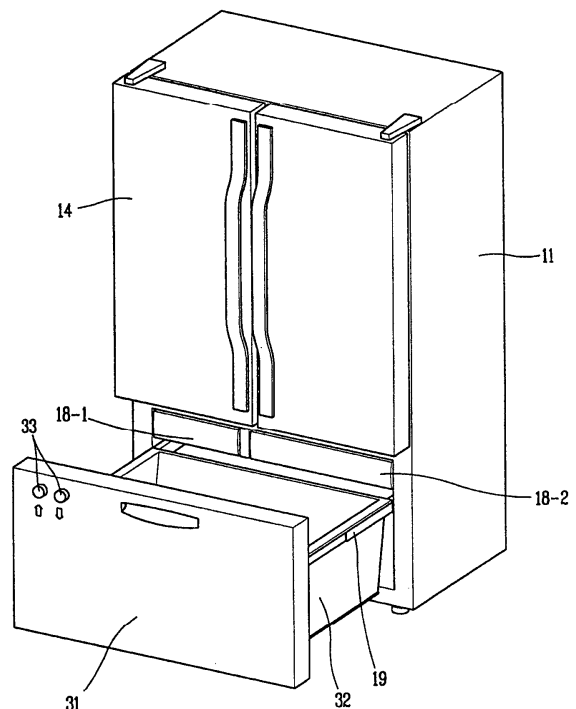
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(54) **Apparatus for controlling container of refrigerator and method thereof**

(57) Disclosed are an apparatus for controlling a container of a refrigerator and a method thereof. The apparatus comprises: a body (11) having an upper cooling chamber and a lower cooling chamber having an opened front surface and separated from each other; an upper door (14) for opening and closing the opened front surface of the upper cooling chamber; a lower door (41) for opening and closing the opened front surface of the lower cooling chamber by being slid in a back and forth direction of the body; a lower container (32) formed at a rear surface of the lower door to be movable in an up and down direction of the body and integrally slid with the lower door; a plurality of upper containers (18-1, 18-2) slidable in a back and forth direction of the body and formed at the rear surface of the lower door and at an upper portion of the lower container; and a control means for controlling the lower container (32) to be lifted or lowered.

FIG. 3



EP 1 655 562 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a refrigerator, and more particularly, to an apparatus for controlling a container of a refrigerator and a method thereof.

2. Description of the Conventional Art

[0002] Generally, a refrigerator is composed of an upper cooling chamber and a lower cooling chamber. A mechanical chamber in which a compressor, etc. are installed is formed at a rear lower portion of the lower cooling chamber.

[0003] A recent refrigerator is composed of an upper door and a lower door for independently opening and closing the upper cooling chamber and the lower cooling chamber. The upper door is moved by an opening/closing method, and the lower door is moved by a pulling/pushing method.

[0004] The conventional refrigerator will be explained with reference to FIGs. 1 and 2.

[0005] FIG. 1 is a perspective view showing a construction of a refrigerator in accordance with the conventional art, and FIG. 2 is a sectional view of a lower portion of a body of the refrigerator when a door is closed in accordance with the conventional art.

[0006] As shown, the conventional refrigerator comprises: a body 11 having an upper cooling chamber 12 and a lower cooling chamber 13 separated from each other based on a partition wall 17 formed in a horizontal direction therein; a plurality of upper doors 14 for opening and closing an opened front surface of the upper cooling chamber 12; and a lower door 15 for opening and closing an opened front surface of the lower cooling chamber 13. A mechanical chamber 21 for accommodating a compressor 22, etc. is formed at a rear lower portion of the body 11.

[0007] The conventional refrigerator will be explained in more detail as follows.

[0008] The body 11 is composed of the upper cooling chamber 12 and the lower cooling chamber 13. The upper cooling chamber 12 and the lower cooling chamber are separated from each other by the partition wall 17 formed in a horizontal direction.

[0009] A pair of upper doors 14 are rotatably connected to the opened front surface of the upper cooling chamber 12.

[0010] The lower door 15 is connected to the opened front surface of the lower cooling chamber 13, and opens and closes the lower cooling chamber 13 by being slid in a back and forth direction of the body 11. A door rail 19 for supporting the lower door 15 to be slidable is installed at both inner walls of the lower cooling chamber 13 with a slidable state in a back and forth direction of

the body 11. The lower cooling chamber 13 is provided with a plurality of drawers 18-1 and 18-2 having an upwardly opened box shape to store food, etc. therein.

[0011] A basket 16 having an upwardly opened box shape to store food, etc. therein is provided at a rear surface of the lower door 15 with a slidable state in a back and forth direction of the body 11, and is integrally moved with the lower door 15.

[0012] However, in the conventional refrigerator, since the basket 16 provided at the rear surface of the lower door 15 is installed at a low position, a user has to bent his or her waist or crouch at the time of storing food in the basket 16 or taking food out of the basket 16 thereby to have an inconvenience.

SUMMARY OF THE INVENTION

[0013] Therefore, an object of the present invention is to provide an apparatus for controlling a container of a refrigerator and a method thereof capable of solving a user's inconvenience at the time of storing food in the container or taking food out of the container by automatically lifting or lowering the container provided at a rear surface of a lower door of the refrigerator by the user's simple switch pressing operation.

[0014] Another object of the present invention is to provide a control circuit of a container of a refrigerator capable of automatically controlling the container provided at a rear surface of a lower door of the refrigerator to be lifted or lowered by a user's simple switch pressing operation.

[0015] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided an apparatus for controlling a container of a refrigerator comprising: a body having an upper cooling chamber and a lower cooling chamber having an opened front surface and separated from each other; an upper door for opening and closing the opened front surface of the upper cooling chamber; a lower door for opening and closing the opened front surface of the lower cooling chamber by being slid in a back and forth direction of the body; a lower container formed at a rear surface of the lower door to be movable in an up and down direction of the body; a plurality of upper containers slidable in a back and forth direction of the body and formed at the rear surface of the lower door and at an upper portion of the lower container; and a control means for controlling the lower container to be lifted or lowered.

[0016] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings, which are includ-

ed to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0018] In the drawings:

FIG. 1 is a perspective view showing a construction of a refrigerator in accordance with the conventional art;

FIG. 2 is a sectional view of a lower portion of a body of the refrigerator when a door is closed in accordance with the conventional art;

FIG. 3 is a perspective view showing a construction of a refrigerator according to the present invention; FIG. 4 is a flow chart showing a control method for a lower container of the refrigerator according to the present invention; and

FIG. 5 is a circuit diagram for controlling a motion of the lower container of the refrigerator according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0020] Hereinafter, with reference to FIGs. 3 to 5, will be explained an apparatus for controlling a container of a refrigerator and a method thereof capable of solving a user's inconvenience at the time of storing food in the container or taking food out of the container by automatically lifting or lowering the container provided at a rear surface of a lower door of the refrigerator by the user's simple switch pressing operation by providing a simple circuit for automatically controlling the container to be lifted or lowered.

[0021] FIG. 3 is a perspective view showing a construction of a refrigerator according to the present invention.

[0022] As shown, the refrigerator according to the present invention comprises: a body 11 having an upper cooling chamber and a lower cooling chamber having an opened front surface and separated from each other; an upper door 14 for opening and closing the opened front surface of the upper cooling chamber; a lower door 41 for opening and closing the opened front surface of the lower cooling chamber by being slid in a back and forth direction of the body 11; a lower container 32 formed at a rear surface of the lower door 41 to be slidable integrally with the lower door 41 and movable in an up and down direction of the body; a plurality of upper containers 18-1 and 18-2 slidable in a back and forth direction of the body and formed at the rear surface of the lower door and at an upper portion of the lower container; and a control means (not shown) for controlling the lower container 32 to be lifted or lowered.

[0023] Hereinafter, a method for controlling the con-

tainer of the refrigerator according to the present invention will be explained with reference to FIG. 4.

[0024] FIG. 4 is a flow chart showing a control method for the lower container of the refrigerator according to the present invention.

[0025] As shown, the method for controlling the container of the refrigerator according to the present invention comprises the steps of: sensing an opening of the upper door and each opening of the plural upper containers formed at a rear upper portion of the lower door (S41); receiving a user's selection signal for selecting a lifting mode or a lowering mode of the lower container installed at a rear lower portion of the lower door (S42); and lifting or lowering the lower container based on an opening of the upper door, an opening of the upper containers, and the user's selection signal (S43).

[0026] The method for controlling the container of the refrigerator according to the present invention will be explained in more detail as follows.

[0027] First, the control means (not shown) includes: an input unit for receiving a user's selection signal for selecting a lifting mode or a lowering mode of the lower container; a relay unit for selecting a driving circuit for controlling a lifting mode of the lower container or a driving circuit for controlling a lowering mode of the lower container by the user's selection signal; a lifting unit for lifting or lowering the lower container according to the lifting mode or the lowering mode; a maximum sensing switch for sensing a maximum position of the lower container at the time of the lifting mode of the lower container; a minimum sensing switch for sensing a minimum position of the lower container at the time of the lowering mode of the lower container; a first opening sensing switch for sensing an opening of the upper door at the time of the lifting mode of the lower container; and a second opening sensing switch for sensing each opening of the plural upper containers at the time of the lifting mode of the lower container. The relay unit is composed of a first relay and a second relay interworked each other, and the input unit is composed of a first three-way switch and a second three-way switch interworked each other.

[0028] When the user opens the lower door 41, the first opening sensing switch senses an opening of the upper door and the second opening sensing switch senses an opening of the plural upper containers (S41). The plural upper containers are composed of a left upper container (18-1) and a right upper container (18-2). Also, the second opening sensing switch is composed of a left opening sensing switch and a right opening sensing switch. The left opening sensing switch senses an opening of the left upper container 18-1, and the right opening sensing switch senses an opening of the right upper container 18-2.

[0029] When the user selects a lifting mode or a lowering mode of the lower container, the input unit 33 receives a selection signal for selecting the lifting mode or the lowering mode of the lower container (S42).

[0030] The control means (not shown) lifts or lowers

the lower container on the basis of results sensed by the first opening sensing switch, the left opening sensing switch, and the right opening sensing switch and the selection signal (S43).

[0031] That is, when at least one of the upper door 14, the left upper container 18-1, and the right upper container 18-2 is opened, a power supply to the lifting unit is cut-off and thereby the lower container 32 is not lifted or lowered. On the other hand, when none of the upper door 14, the left upper container 18-1, and the right upper container 18-2 is opened, the lifting unit lifts or lowers the lower container 32 by the selection signal. The lifting unit is composed of a lifting mode button and a lowering mode button. While the lifting mode button is pressed, the lifting unit continuously lifts the lower container 32 in a lifting mode. Also, while the lowering mode button is pressed, the lifting unit continuously lowers the lower container 32 in a lowering mode. As the lifting unit, a direct current motor is preferably used.

[0032] When the lower container 32 reaches a preset position in the lifting mode, the maximum sensing switch senses the lower container 32 and cuts off a power supply to the lifting unit thereby to stop the lifting of the lower container 32. Also, when the lower container 32 reaches a preset position in the lowering mode, the minimum sensing switch senses the lower container 32 and cuts off a power supply to the lifting unit thereby to stop the lowering of the lower container 32. When an overload is applied to the lifting unit at the time of the lifting mode, that is, when an object or a part of a user's body is fitted into the lower container at the time of the lifting mode, the lifting of the lower container 32 can be stopped by cutting off a power supply to the lifting unit by a current breaker.

[0033] A control circuit for the container of the refrigerator according to the present invention will be explained in more detail with reference to FIG. 5.

[0034] FIG. 5 is a circuit diagram for controlling a motion of the lower container of the refrigerator according to the present invention.

[0035] Referring to FIG. 5, SW1 denotes the maximum sensing switch, SW2 denotes the left opening sensing switch for the left upper container, SW3 denotes the right opening sensing switch for the right upper container, SW4 denotes the opening sensing switch for the upper door, SW5 denotes the minimum sensing switch, SW6 denotes the input unit, K1 denotes the relay unit, CON2 denotes the direct current (Dc) motor of the lifting unit, and J2 is a current limiter.

[0036] When the user presses the lowering mode button, two interworked three-way switches of the input unit respectively connect points 2 and 1 and points 5 and 4. Also, two interworked relays of the relay unit respectively connect points 10 and 7 and points 4 and 8. According to this, power VCC is connected to the DC motor of the lifting unit via the point 2, the point 1, and the SW5, and is connected to a ground via the point 8, the point 4, and the point 5, thereby forming a driving circuit for controlling

the lowering mode. The lifting unit connected to the driving circuit for controlling the lowering mode lowers the lower container 32. When the user stops pressing the lowering mode button while the lower container 32 is moved in the lowering mode, the SW6 is opened and thereby the power VCC is not supplied to the DC motor of the lifting unit any longer thus to stop the DC motor. Also, even if the user continues to press the lowering mode button, when the lower container 32 reaches a preset position, that is, when the lower container 32 reaches the initial start position, the SW5 is opened and thereby the power VCC is not supplied to the DC motor any longer thus to stop the DC motor.

[0037] When the user presses the lifting mode button, two interworked three-way switches of the input unit respectively connect points 2 and 3 and points 5 and 6. Also, two interworked relays of the relay unit respectively connect points 18 and 8 and points 6 and 7. According to this, the power VCC is connected to the DC motor of the lifting unit via the point 2, the point 3, the SW1, the SW2, the SW3, and the SW4 and is connected to the ground via the point 7, the point 6, and the point 5, thereby forming a driving circuit for controlling the lifting mode. At this time, since a current direction in the lifting mode is opposite to a current direction of the lowering mode, a rotation direction of the DC motor in the lifting mode is opposite to a rotation direction of the DC motor in the lowering mode. The lifting unit connected to the driving circuit for controlling the lifting mode lifts the lower container 32 when the SW2, the SW3, and the SW4 are closed, that is, when an opening of the left upper container 18-1, an opening of the right upper container 18-2, and an opening of the upper door are not sensed. When the user stops pressing the lifting mode button while the lower container 32 is moved in the lifting mode, the SW6 is opened and thereby the power VCC is not supplied to the DC motor of the lifting unit any longer thus to stop the DC motor. Also, when the lower container 32 reaches a preset position, the SW1 is opened and thereby the power VCC is not supplied to the DC motor of the lifting unit any longer thus to stop the DC motor. Also, when an overload is applied to the DC motor at the time of the lifting mode, that is, when an object or a part of a user's body is fitted into the lower container at the time of the lifting mode, the power VCC is not supplied to the DC motor of the lifting unit any longer thereby to stop the DC motor.

[0038] When the upper door is completely opened, there is no problem in lifting the lower container. Therefore, the lower container is lifted by the lifting mode button.

[0039] As aforementioned, in the present invention, the container provided at a rear surface of the lower door of the refrigerator is automatically lifted or lowered by the user's simple switch pressing operation. According to this, the user's inconvenience caused when food is to be stored in the container or to be taken out from the container can be solved.

[0040] Also, in the present invention, the circuit for automatically controlling the container provided at the rear surface of the lower door of the refrigerator to be lifted or lowered by the user's simple switch pressing operation is provided.

[0041] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

Claims

1. An apparatus for controlling a container of a refrigerator comprising:

a body having an upper cooling chamber and a lower cooling chamber having an opened front surface and separated from each other;
 an upper door for opening and closing the opened front surface of the upper cooling chamber;
 a lower door for opening and closing the opened front surface of the lower cooling chamber by being slid in a back and forth direction of the body;
 a lower container formed at a rear surface of the lower door to be movable in an up and down direction of the body and integrally slid with the lower door;
 a plurality of upper containers slidable in a back and forth direction of the body and formed at the rear surface of the lower door and at an upper portion of the lower container; and
 a control means for controlling the lower container to be lifted or lowered.

2. The apparatus of claim 1, wherein the control means includes:

an input unit for receiving a user's selection signal for selecting a lifting mode or a lowering mode of the lower container;
 a relay unit for selecting a driving circuit for controlling a lifting mode of the lower container or a driving circuit for controlling a lowering mode of the lower container by the user's selection signal;
 a lifting unit for lifting or lowering the lower container according to the lifting mode or the lowering mode;

a maximum sensing switch for sensing a maximum position of the lower container at the time of the lifting mode of the lower container;
 a minimum sensing switch for sensing a minimum position of the lower container at the time of the lowering mode of the lower container;
 a first opening sensing switch for sensing an opening of the upper door at the time of the lifting mode of the lower container; and
 a second opening sensing switch for sensing each opening of the plural upper containers at the time of the lifting mode of the lower container.

3. The apparatus of claim 2, wherein the input unit includes:

a first switch for electrically connecting the lifting unit and the driving circuit for controlling the lifting mode of the lower container; and
 a second switch for electrically connecting the lifting unit and the driving circuit for controlling the lowering mode of the lower container.

4. The apparatus of claim 2, wherein the input unit includes two interworked three-way switches, the lifting unit includes a direct current motor, and the relay unit includes two interworked relays.

5. The apparatus of claim 2, wherein the first opening sensing switch is turned off when the upper door is closed and is turned on when the upper door is opened thereby to electrically connect the lifting unit and the driving circuit for controlling the lifting mode when the upper door is closed.

6. The apparatus of claim 2, wherein the second opening sensing switch is turned off when an opening of at least one of the plural upper containers is sensed thereby to prevent a conversion of the lower container into a lifting mode.

7. A method for controlling a container of a refrigerator comprising the steps of:

sensing an opening of the upper door and each opening of plural upper containers formed at a rear upper portion of the lower door;
 receiving a user's selection signal for selecting a lifting mode or a lowering mode of the lower container installed at a rear lower portion of the lower door; and
 lifting or lowering the lower container based on an opening of the upper door, each opening of the upper containers, and the user's selection signal.

8. The method of claim 7, wherein in the step of sensing an opening of the upper door or each opening of the

upper containers, the user's selection signal for lifting the lower container is cut off.

9. The method of claim 7, wherein when the lower container is lifted up to a preset position, the user's selection signal for lifting the lower container is cut off. 5
10. The method of claim 7, wherein when the lower container is lowered up to a preset position, the user's selection signal for lowering the lower container is cut off. 10

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FIG. 1
CONVENTIONAL ART

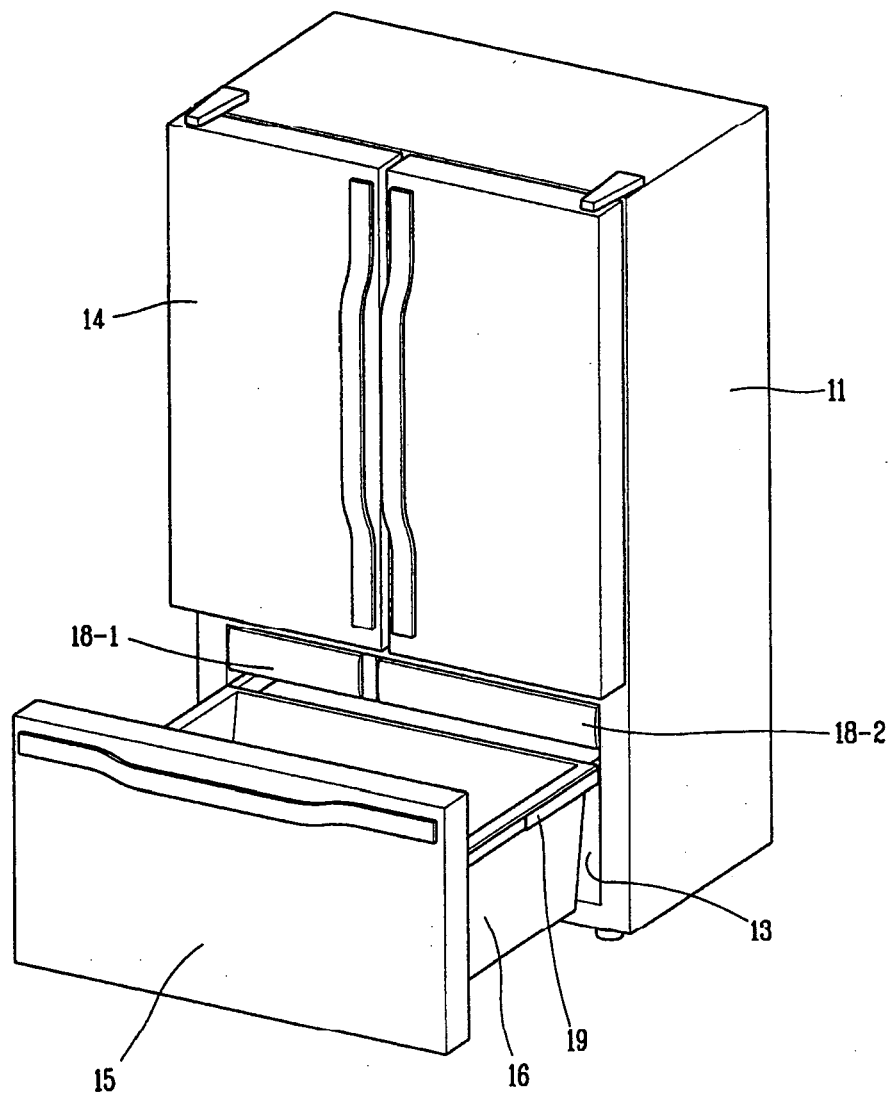


FIG. 2
CONVENTIONAL ART

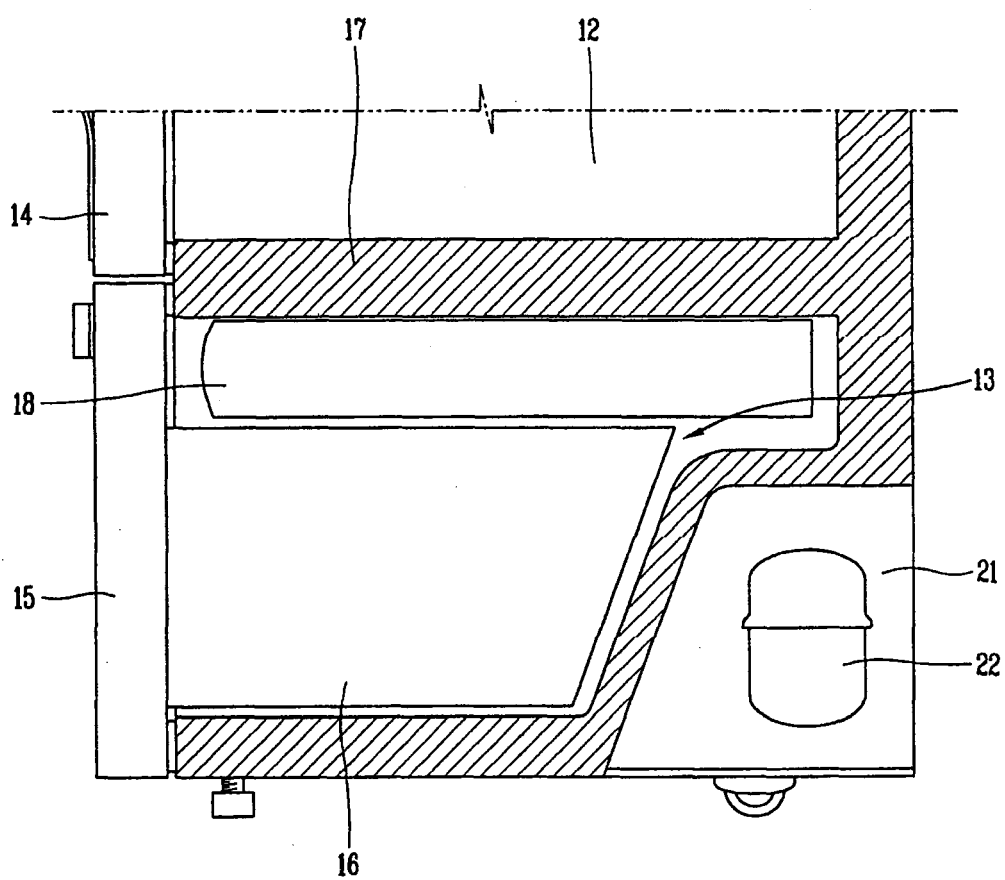


FIG. 3

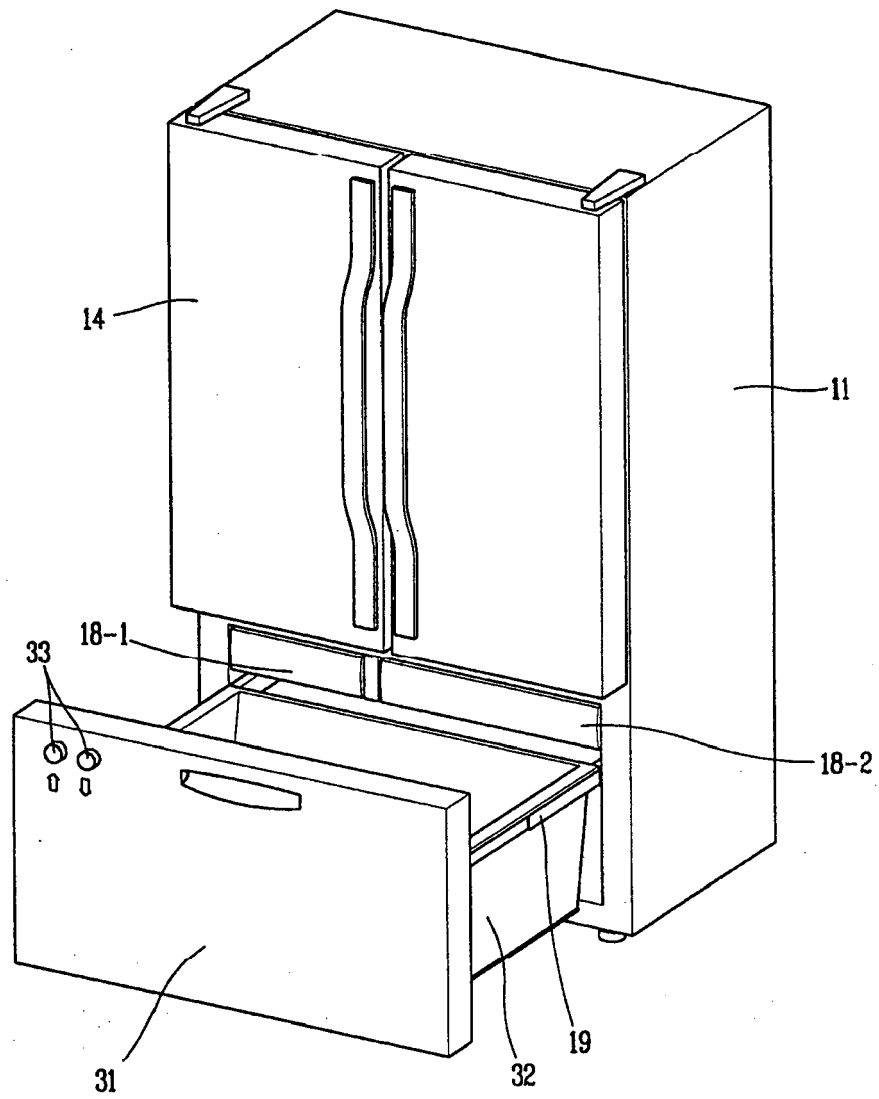


FIG. 4

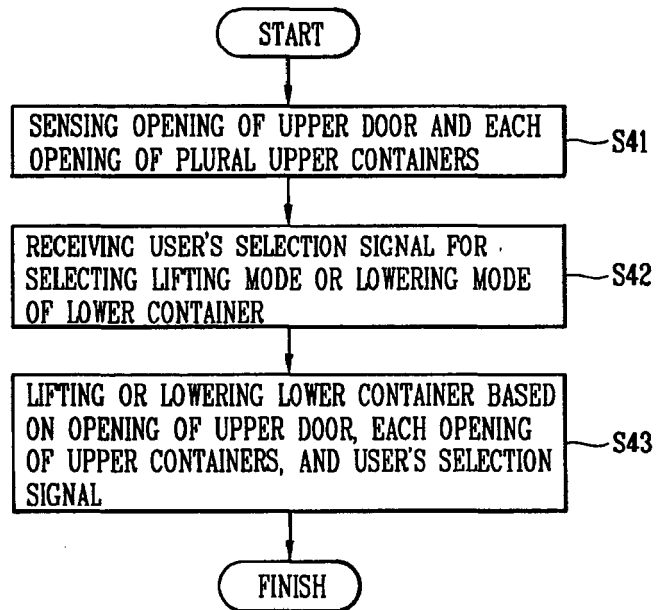


FIG. 5

